MARKING SCHEME of PB-1

SUBJECT: MATHEMATICS CLASS: XII

SECTION-A

ANS.1	c)	1
ANS.2	(d)	1
ANS.3	c) 10.8 cm^2/s	1
ANS.4	(d)	1
ANS.5	c)	1
ANS.6	(a)	1
ANS.7	d)	1
ANS.8	b) 5π/6	1
ANS.9	(c)	1
ANS.10	(a) Continuous at x = 4	1
ANS.11	(a)	1
ANS.12	c)	1
ANS.13	b)	1
ANS.14	a)	1
ANS.15	(c)	1
ANS.16	(c) log (sec x + tan x)	1
ANS.17	d)	1
ANS.18	(b)	1
ANS.19	a) Both A and R are true and R is the correct explanation of A	1
ANS.20	(b) Both A and R are true but R is not the correct explanation of A.	1

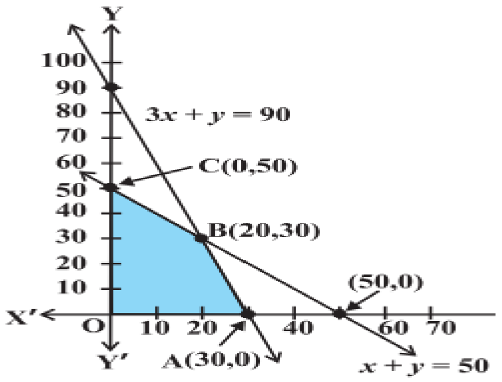
SECTION-B

ANS.21	The area *A* of a circle with radius r is given by $A = \pi r^2$ $\frac{dA}{dt} = 2\pi r\frac{dr}{dt} \Rightarrow 100 = 2\pi r \times 5 \Rightarrow r = \frac{10}{\pi}$cm. $[\frac{dr}{dt} = 5$cm/s, $\frac{dA}{dt} = 100$ cm^2/s] Hence, radius of the circle is $r = \frac{10}{\pi}$ cm.	1 1
ANS.22	The value of $\sin(\frac{\pi}{3} - \sin^{-1}(-\frac{1}{2}))$ $= \sin(\frac{\pi}{3} - (-\frac{\pi}{6}))$ $= \sin\frac{\pi}{2}$ $= 1$	1 1
ANS.23	For continuity at $x = 1$, $\lim_{x\to 1^-} f(x) = \lim_{x\to 1^+} f(x) = f(1) \Rightarrow \lim_{x\to 1^-}(4) = \lim_{x\to 1^+}(kx^2) = k \Rightarrow$ $4 = k = k$ $\Rightarrow k = 4$	1 1

ANS.24	$\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 6 & 14 \\ 1 & -\lambda & 7 \end{vmatrix} = \vec{0} \Rightarrow \hat{i}(42+14\lambda) - \hat{j}(14-14) + \hat{k}(-2\lambda-6) = \vec{0} \Rightarrow \lambda = -3$	2
ANS.25	$\vec{r} = 2\vec{a} - \vec{b} + 3\vec{c} = 2\hat{i} + 2\hat{j} + 2\hat{k} - 4\hat{i} + 2\hat{j} - 3\hat{k} + 3\hat{i} - 6\hat{j} + 3\hat{k} \Rightarrow \vec{r} = \hat{i} - 2\hat{j} + 2\hat{k}$ Vector of magnitude 6 units and parallel to $(2\vec{a} - \vec{b} + 3\vec{c})$ is $6\hat{r}$. Vector $= 6\left(\dfrac{\hat{i} - 2\hat{j} + 2\hat{k}}{\sqrt{1+4+4}}\right) = 2\hat{i} - 4\hat{j} + 4\hat{k}$	1 1
SECTION-C		
ANS.26	Let b stand for boy and g for girl. The sample space of the experiment is S = {(b, b), (g, b), (b, g), (g, g)} Let E and F denote the following events : E : 'both the children are boys' F : 'at least one of the child is a boy' Then $E = \{(b,b)\}$ and $F = \{(b,b), (g,b), (b,g)\}$ Now $E \cap F = \{(b,b)\}$ Thus $P(F) = \dfrac{3}{4}$ and $P(E \cap F) = \dfrac{1}{4}$ Therefore $P(E\|F) = \dfrac{P(E \cap F)}{P(F)} = \dfrac{\frac{1}{4}}{\frac{3}{4}} = \dfrac{1}{3}$	½ ½ 1 1
ANS.27	Let $y = x^{\sin x}$ Taking logarithm on both sides, we have $\log y = \sin x \log x$ Therefore $\dfrac{1}{y} \cdot \dfrac{dy}{dx} = \sin x \dfrac{d}{dx}(\log x) + \log x \dfrac{d}{dx}(\sin x)$ or $\dfrac{1}{y}\dfrac{dy}{dx} = (\sin x)\dfrac{1}{x} + \log x \cos x$ or $\dfrac{dy}{dx} = y\left[\dfrac{\sin x}{x} + \cos x \log x\right]$ $= x^{\sin x}\left[\dfrac{\sin x}{x} + \cos x \log x\right]$ $= x^{\sin x - 1} \cdot \sin x + x^{\sin x} \cdot \cos x \log x$	½ 1 ½ 1

<table>
<tr><td>ANS.28</td><td>

We observe that the feasible region is bounded.



The coordinates of the corner points are (0, 0), (30, 0), (20, 30) and (0, 50) respectively.

maximum value of Z is 120 at the point (30, 0).

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1/2</td></tr>
<tr><td>ANS.29</td><td>

$(\vec{a}+\vec{b}).(\vec{a}-\vec{b}) = 8 \quad \Rightarrow \vec{a}.\vec{a} - \vec{a}.\vec{b} + \vec{b}.\vec{a} - \vec{b}.\vec{b} = 8 \qquad \Rightarrow |\vec{a}|^2 - |\vec{b}|^2 = 8$

$\Rightarrow (8|\vec{b}|)^2 - |\vec{b}|^2 = 8 \qquad [\text{Given that: } |\vec{a}| = 8|\vec{b}|]$

$\Rightarrow 64|\vec{b}|^2 - |\vec{b}|^2 = 8$

$\Rightarrow 63|\vec{b}|^2 = 8$ therefore, $|\vec{b}|^2 = \frac{8}{63}$

$\Rightarrow |\vec{b}| = \sqrt{\frac{8}{63}}$ [Magnitude of a vector is non- negative]

$\Rightarrow |\vec{b}| = \frac{2\sqrt{2}}{3\sqrt{7}}$

$\Rightarrow |\vec{a}| = 8|\vec{b}| = \frac{8 \times 2\sqrt{2}}{3\sqrt{7}} = \frac{16\sqrt{2}}{3\sqrt{7}}$

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<tr><td>ANS.30</td><td>

$\frac{dy}{dx} = \frac{x+1}{2-y}$ ….(1)

Separating the variables in equation (1), we get

$(2 - y)\, dy = (x + 1)\, dx$ …….(2)

Integrating both the side and getting

$2y - y^2/2 = x^2/2 + x + C_1$

Simplifying and getting

$x^2 + y^2 + 2x - 4y + C = 0$ (where $C = 2C_1$)

which is the general solution of equation (1)

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<tr><td>ANS.31</td><td>

$\int \frac{dx}{1+\tan x} = \int \frac{\cos x\, dx}{\cos x + \sin x}$

$= \frac{1}{2}\int \frac{(\cos x + \sin x + \cos x - \sin x)\, dx}{\cos x + \sin x}$

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$$= \frac{1}{2}\int dx + \frac{1}{2}\int \frac{\cos x - \sin x}{\cos x + \sin x}\, dx$$

$$= \frac{x}{2} + \frac{C_1}{2} + \frac{1}{2}\int \frac{\cos x - \sin x}{\cos x + \sin x}\, dx \quad \ldots (1)$$ 1

Now, consider $I = \int \frac{\cos x - \sin x}{\cos x + \sin x}\, dx$

Put $\cos x + \sin x = t$ so that $(\cos x - \sin x)\, dx = dt$ ½

Therefore $I = \int \frac{dt}{t} = \log|t| + C_2 = \log|\cos x + \sin x| + C_2$

Putting it in (1), we get

$$\int \frac{dx}{1 + \tan x} = \frac{x}{2} + \frac{C_1}{2} + \frac{1}{2}\log|\cos x + \sin x| + \frac{C_2}{2}$$

$$= \frac{x}{2} + \frac{1}{2}\log|\cos x + \sin x| + \frac{C_1}{2} + \frac{C_2}{2}$$

$$= \frac{x}{2} + \frac{1}{2}\log|\cos x + \sin x| + C, \left(C = \frac{C_1}{2} + \frac{C_2}{2}\right)$$ 1

OR

Let $I = \int_0^{\frac{\pi}{2}} \frac{\sin^4 x}{\sin^4 x + \cos^4 x}\, dx \quad \ldots (1)$

Then, by P_4 1/2

$$I = \int_0^{\frac{\pi}{2}} \frac{\sin^4(\frac{\pi}{2} - x)}{\sin^4(\frac{\pi}{2} - x) + \cos^4(\frac{\pi}{2} - x)}\, dx = \int_0^{\frac{\pi}{2}} \frac{\cos^4 x}{\cos^4 x + \sin^4 x}\, dx \quad \ldots (2)$$ 1

Adding (1) and (2), we get

$$2I = \int_0^{\frac{\pi}{2}} \frac{\sin^4 x + \cos^4 x}{\sin^4 x + \cos^4 x}\, dx = \int_0^{\frac{\pi}{2}} dx = [x]_0^{\frac{\pi}{2}} = \frac{\pi}{2}$$ 1

Hence $I = \frac{\pi}{4}$ ½

SECTION-D

ANS.32 The given equation is $y = |x + 3|$.

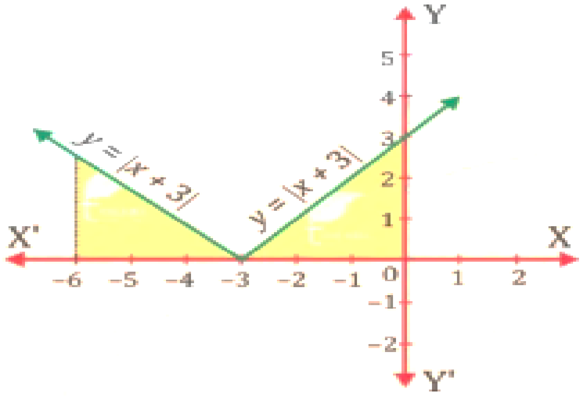
The corresponding values of x and y are given in the following table:

x	-6	-5	-4	-3	-2	-1	0
y	3	2	1	0	1	2	3

On plotting these points, we obtain the graph of $y = |x + 3|$ as follows: 1

It is known that:

$(x+3) \leq x \leq -3$ and $(x+3) \geq 0$ for $-3 \leq x \leq 0$. ½



1

$$\int_{-6}^{0} |x+3|\,dx = -\int_{-6}^{-3} (x+3)\,dx + \int_{-3}^{0} (x+3)\,dx$$ 1

$$= \left[\frac{x^2}{2} + 3x\right]_{-6}^{-3} - \left[\frac{x^2}{2} + 3x\right]_{-3}^{0}$$

$$= \left[\left(\frac{(-3)^2}{2} + 3(-3)\right) - \left(\frac{(-6)^2}{2} + 3(-6)\right)\right] - \left[0 - \left(\frac{(-3)^2}{2} + 3(-3)\right)\right]$$ 1

$$= \left[\frac{9}{2}\right] - \left[-\frac{9}{2}\right] = 9$$ ½

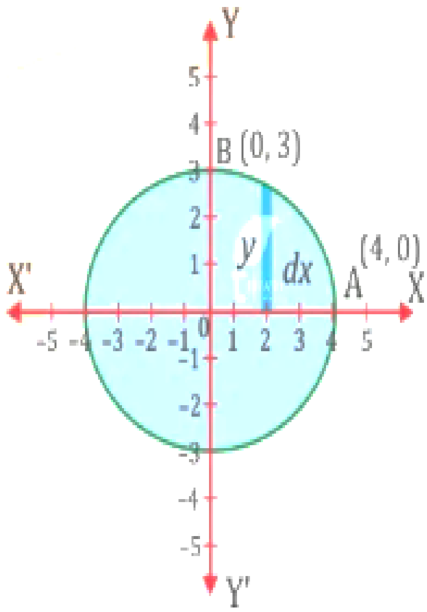
OR

The given equation of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$

It can be observed that the ellipse is symmetrical about x-axis and y-axis.

Area bounded by ellipse = 4 × Area of OAB 1

Area of ABCD $= \int_0^4 y\,dx$ 1



$$= \int_0^4 3\sqrt{1 - \frac{x^2}{16}}\,dx = \frac{3}{4}\int_0^4 \sqrt{16 - x^2}\,dx$$ 1

$$= \frac{3}{4}\left[\frac{x}{2}\sqrt{16 - x^2} + \frac{16}{2}\sin^{-1}\frac{x}{4}\right]_0^4$$

$$= \frac{3}{4}\left[2\sqrt{16 - 16} + 8\sin^{-1}(1) - 0 - 8\sin^{-1}(0)\right]$$ 1

$$= \frac{3}{4}\left[\frac{8\pi}{2}\right]$$

$$\Rightarrow \frac{3}{4}\left[\frac{8\pi}{2}\right] = 3\pi$$

Therefore, area bounded by the ellipse = 4 × 3π = 12π units 1

ANS.33

$\vec{r} = (\hat{i} + 2\hat{j} + 3\hat{k}) + \lambda(\hat{i} - 3\hat{j} + 2\hat{k})$ and $\vec{r} = 4\hat{i} + 5\hat{j} + 6\hat{k} + \mu(2\hat{i} + 4\hat{j} + \hat{k})$

It is known that the shortest distance between the lines $\vec{r} = \vec{a_1} + \lambda\,\vec{b_1}$ *and* $\vec{r} = \vec{a_2} + \mu\,\vec{b_2}$ is given by

$$d = \left|\frac{(\vec{b_1} \times \vec{b_2}).(\vec{a_2} - \vec{a_1})}{|\vec{b_1} \times \vec{b_2}|}\right| \quad \dots(1)$$ 1

Comparing the given equations with $\vec{r} = \vec{a_1} + \lambda\,\vec{b_1}$ and $\vec{r} = \vec{a_2} + \mu\,\vec{b_2}$, we have

$\vec{a_1} = \hat{i} + 2\hat{j} + 3\hat{k}$

$\vec{b_1} = \hat{i} - 3\hat{j} + 2\hat{k}$

$\vec{a_2} = 4\hat{i} + 5\hat{j} + 6\hat{k}$ 1

$\vec{b_2} = 2\hat{i} + 3\hat{j} + \hat{k}$

Therefore, $\vec{a_2} - \vec{a_1} = (4\hat{i} + 5\hat{j} + 6\hat{k}) - (\hat{i} + 2\hat{j} + 3\hat{k}) = 3\hat{i} + 3\hat{j} + 3\hat{k}$ and ½

$$\vec{b_1} \times \vec{b_2} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & -3 & 2 \\ 2 & 3 & 1 \end{vmatrix} = (-3-6)\hat{i} - (1-4)\hat{j} + (3+6)\hat{k} = -9\hat{i} + 3\hat{j} + 9\hat{k}$$ ½

$\Rightarrow |\vec{b_1} \times \vec{b_2}| = \sqrt{(-9)^2 + (3)^2 + (9)^2} = \sqrt{81 + 9 + 81} = 3\sqrt{19}$ ½

$(\vec{b_1} \times \vec{b_2}).(\vec{a_2} - \vec{a_1}) = (-9\hat{i} + 3\hat{j} + 9\hat{k}).(3\hat{i} + 3\hat{j} + 3\hat{k}) = -9 \times 3 + 3 \times 3 + 9 \times 3 = 9$ 1

Substituting all the values in equation (1), we get

$$d = \left|\frac{9}{3\sqrt{19}}\right| = \frac{3}{\sqrt{19}}$$

Therefore, the shortest distance between the two given lines is $\frac{3}{\sqrt{19}}$ units. ½

OR

Equeations of the given lines $\frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1}$ and $\frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1}$

It is known that the shortest distance between the two lines,

$\frac{x+x_1}{a_1} = \frac{y+y_1}{b_1} = \frac{z+z_1}{c_1}$ and $\frac{x-x_2}{a_2} = \frac{y-y_2}{b_2} = \frac{z-z_2}{c_2}$ is given by ½

$$d = \frac{\begin{vmatrix} x_2 - x_1 & y_2 - y_1 & z_2 - z_1 \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix}}{\sqrt{(b_1c_2 - b_2c_1)^2 + (c_1a_2 - c_2a_1)^2 + (a_1b_2 - a_2b_1)^2}} \quad \dots(1)$$ 1

Comparing the given equations, we have

$x_1 = -1,\quad y_1 = -1 \quad z_1 = -1$

$a_1 = 7 \quad b_1 = -6 \quad c_1 = 1$

$x_2 = 3 \quad y_2 = 5 \quad z_2 = 7$ 1

$a_2 = 1 \quad b_2 = -2 \quad c_2 = 1$

Then

$$\begin{vmatrix} x_2 - x_1 & y_2 - y_1 & z_2 - z_1 \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix} = \begin{vmatrix} 4 & 6 & 8 \\ 7 & -6 & 1 \\ 1 & -2 & 1 \end{vmatrix}$$

$= 4(-6+2) - 6(7-1) + 8(-14+6) = -16 - 36 - 64 = -116$ 1

and $\sqrt{(b_1c_2 - b_2c_1)^2 + (c_1a_2 - c_2a_1)^2 + (a_1b_2 - a_2b_1)^2} = \sqrt{(-6+2)^2 + (1+7)^2 + (-14+6)^2}$

$= \sqrt{16 + 36 + 64} = \sqrt{116} = 2\sqrt{29}$ 1

Substituting all the values in equation (1), we have

$$d = \frac{-116}{2\sqrt{29}} = \frac{-58}{\sqrt{29}} = -2\sqrt{29}$$

Since, distance is always non-negative, so, the distance between the given lines is $2\sqrt{29}$ units. ½

ANS.34	Given that: $y = e^{a\cos^{-1}x}$, therefore, Differentiating with respect to x, we have $\frac{dy}{dx} = \frac{d}{dx} e^{a\cos^{-1}x} = e^{a\cos^{-1}x} \frac{d}{dx} a\cos^{-1}x$ $\Rightarrow \frac{dy}{dx} = e^{a\cos^{-1}x} a. \frac{-1}{\sqrt{1-x^2}} = -\frac{ay}{\sqrt{1-x^2}}$ Squaring both the sides, we have $\left(\frac{dy}{dx}\right)^2 = \frac{a^2y^2}{1-x^2}$ $\Rightarrow (1-x^2)\left(\frac{dy}{dx}\right)^2 = a^2y^2$ Differentiating again with respect to x, we have $(1-x^2).2\frac{dy}{dx}.\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 \frac{d}{dx}(1-x^2) = a^2 2y\frac{dy}{dx}$ $\Rightarrow \frac{dy}{dx}\left[2(1-x^2)\frac{d^2y}{dx^2} + \frac{dy}{dx}(-2x)\right] = 2a^2y\frac{dy}{dx}$ $\Rightarrow 2\frac{dy}{dx}\left[(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx}\right] = 2a^2y\frac{dy}{dx}$ $\Rightarrow (1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} = a^2y$ $\Rightarrow (1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} - a^2y = 0$ **OR** We have $y = \sin^{-1}x$. Then $\frac{dy}{dx} = \frac{1}{\sqrt{(1-x^2)}}$ $\sqrt{(1-x^2)}\,\frac{dy}{dx} = 1$ $\frac{d}{dx}\left(\sqrt{(1-x^2)}\,.\,\frac{dy}{dx}\right) = 0$ $\sqrt{(1-x^2)}\cdot\frac{d^2y}{dx^2} + \frac{dy}{dx}\cdot\frac{d}{dx}\left(\sqrt{(1-x^2)}\right) = 0$ $\sqrt{(1-x^2)}\cdot\frac{d^2y}{dx^2} - \frac{dy}{dx}\cdot\frac{2x}{2\sqrt{1-x^2}} = 0$ $(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} = 0$	½ ½ 1 ½ 1½ 1 1 1 1 1 1

ANS.35	Let first, second and third numbers be denoted by x, y and z, respectively. Then, according to given conditions, we have $x + y + z = 6$ $y + 3z = 11$ $x + z = 2y$ or $x - 2y + z = 0$ This system can be written as A X = B, where $A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 3 \\ 1 & 2 & 1 \end{bmatrix}, X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ and $B = \begin{bmatrix} 6 \\ 11 \\ 0 \end{bmatrix}$ Here $\lvert A \rvert = 1(1+6) - (0-3) + (0-1) = 9 \neq 0$. Now we find *adj* A $A_{11} = 1(1+6) = 7,\quad A_{12} = -(0-3) = 3,\quad A_{13} = -1$ $A_{21} = -(1+2) = -3,\quad A_{22} = 0,\quad A_{23} = -(-2-1) = 3$ $A_{31} = (3-1) = 2,\quad A_{32} = -(3-0) = -3,\quad A_{33} = (1-0) = 1$ Hence $adj\ A = \begin{bmatrix} 7 & -3 & 2 \\ 3 & 0 & -3 \\ -1 & 3 & 1 \end{bmatrix}$ Thus $A^{-1} = \frac{1}{\lvert A \rvert}\ adj\ (A) = \frac{1}{9}\begin{bmatrix} 7 & -3 & 2 \\ 3 & 0 & -3 \\ -1 & 3 & 1 \end{bmatrix}$ Since $X = A^{-1} B$ $X = \frac{1}{9}\begin{bmatrix} 7 & -3 & 2 \\ 3 & 0 & -3 \\ -1 & 3 & 1 \end{bmatrix}\begin{bmatrix} 6 \\ 11 \\ 0 \end{bmatrix}$ or $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \frac{1}{9}\begin{bmatrix} 42-33+0 \\ 18+0+0 \\ -6+33+0 \end{bmatrix} = \frac{1}{9}\begin{bmatrix} 9 \\ 18 \\ 27 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ Thus $x = 1, y = 2, z = 3$	½ ½ ½ 1 ½ 1 1

	OR	
	$A = \begin{bmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{bmatrix}$	
	$\lvert A\rvert = \begin{vmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{vmatrix} = 2(-4+4)+3(-6+4)+5(3-2) = 2(0)+3(-2)+5(1) = -6+5$	
	$= -1 \neq 0$; Inverse of matrix exists.	1
	Find the inverse of matrix: Cofactors of matrix: $A_{11} = 0, A_{12} = 2, A_{13} = 1$ $A_{21} = -1, A_{22} = -9, A_{23} = -5$ $A_{31} = 2, A_{32} = 23, A_{33} = 13$	½
	adj. $A = \begin{bmatrix} 0 & -1 & 2 \\ 2 & -9 & 23 \\ 1 & -5 & 13 \end{bmatrix}$	½
	So, $A^{-1} = \frac{1}{-1}\begin{bmatrix} 0 & -1 & 2 \\ 2 & -9 & 23 \\ 1 & -5 & 13 \end{bmatrix} = \begin{bmatrix} 0 & 1 & -2 \\ -2 & 9 & -23 \\ -1 & 5 & -13 \end{bmatrix}$	1
	Now, matrix of equation can be written as: AX = B $\begin{bmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 11 \\ -5 \\ -3 \end{bmatrix}$ And, $X = A^{-1} B$ $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 & 1 & -2 \\ -2 & 9 & -23 \\ -1 & 5 & -13 \end{bmatrix}\begin{bmatrix} 11 \\ -5 \\ -3 \end{bmatrix}$	1
	$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 & 1 & -2 \\ -2 & 9 & -23 \\ -1 & 5 & -13 \end{bmatrix}\begin{bmatrix} 11 \\ -5 \\ -3 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ Therefore, x = 1, y = 2 and z =3.	1

SECTION-E		
ANS.36	(i) Number of relations is equal to the number of subsets of the set $B \times C = 2^{n(B \times C)}$ $= 2^{n(B) \times n(C)} = 2^{3 \times 2} = 2^6$ ($Where n(A)$ $denotes$ the $number$ of the $elements$ in the $finite$ set A)	1
	(ii) Smallest Equivalence relation on G is $\{(g_1, g_1), (g_2, g_2)\}$	1
	(iii) (a) (A) reflexive but not symmetric = $\{(b_1, b_2), (b_2, b_1), (b_1, b_1), (b_2, b_2), (b_3, b_3), (b_2, b_3)\}$. So the minimum number of elements to be added are $(b_1, b_1), (b_2, b_2), (b_3, b_3), (b_2, b_3)$ {Note : it can be any one of the pair from, (b_3, b_2), (b_1, b_3), (b_3, b_1) in place of (b_2, b_3) $also$}	1
	(B) reflexive and symmetric but not transitive = $\{(b_1, b_2), (b_2, b_1), (b_1, b_1), (b_2, b_2), (b_3, b_3), (b_2, b_3), (b_3, b_2)\}$. So the minimum number of elements to be added are $(b_1, b_1), (b_2, b_2), (b_3, b_3), (b_2, b_3), (b_3, b_2)$	1
	OR (iii) (b) One-one and onto function $x^2 = 4y$. let $y = f(x) = \frac{x^2}{4}$	½
	Let $x_1, x_2 \in [0, 20\sqrt{2}]$ such that $f(x_1) = f(x_2) \Rightarrow \frac{x_1^{\ 2}}{4} = \frac{x_1^{\ 2}}{4}$ $\Rightarrow x_1^{\ 2} = x_2^{\ 2} \Rightarrow (x_1 - x_2)(x_1 + x_2) = 0 \Rightarrow x_1 = x_2$ as $x_1, x_2 \in [0, 20\sqrt{2}]$ $\therefore f$ is one-one function	½
	Now, $0 \le y \le 200$ hence the value of y is non-negative and $f(2\sqrt{y}) = y$	½
	$\therefore$ for any arbitrary $y \in [0, 200]$, the pre-image of y exists in $[0, 20\sqrt{2}]$ hence f is onto function.	½
ANS.37	(a) (ii) 4 – x	1
	(b) (i) 4	1
	(iii) 8 cm	1
	(d) (ii) 6 cm	1
ANS.38	a) iv) 3/8	1
	b) iv) 1/24	1
	c) iv) 5/8	1
	d) iv) 1/3	1